

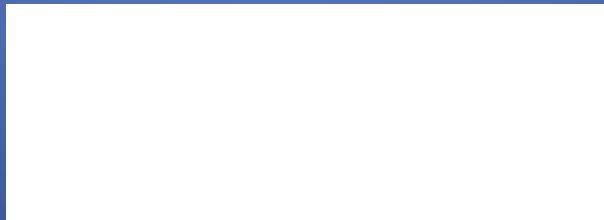
# Best Practices in Roof Design:



Sustainable Energy Efficient Reroofing

# Best Practice Roof Design: Sustainable Energy Efficient Reroofing

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# Goals for the Program

- Learn what is an energy efficient roof.
- Learn what is a sustainable roof.
- Learn the problems in roof replacement.
- Learn where the energy money resides.

# Sustainable Roof Definition

- A sustainable roof is that which:
  - Has the longest trouble-free service life.
  - Has the lowest life cycle cost.
  - Produces the greatest energy saving.
  - Best serves as a platform for other requirements.

# Requirements for Sustainability

- Sound roof drainage design.
- Proper wind resistant construction.
- Proper energy efficiency.
- Proper installation of *all* roof components
- Regular inspection and maintenance.

# Common Low Slope Roofs

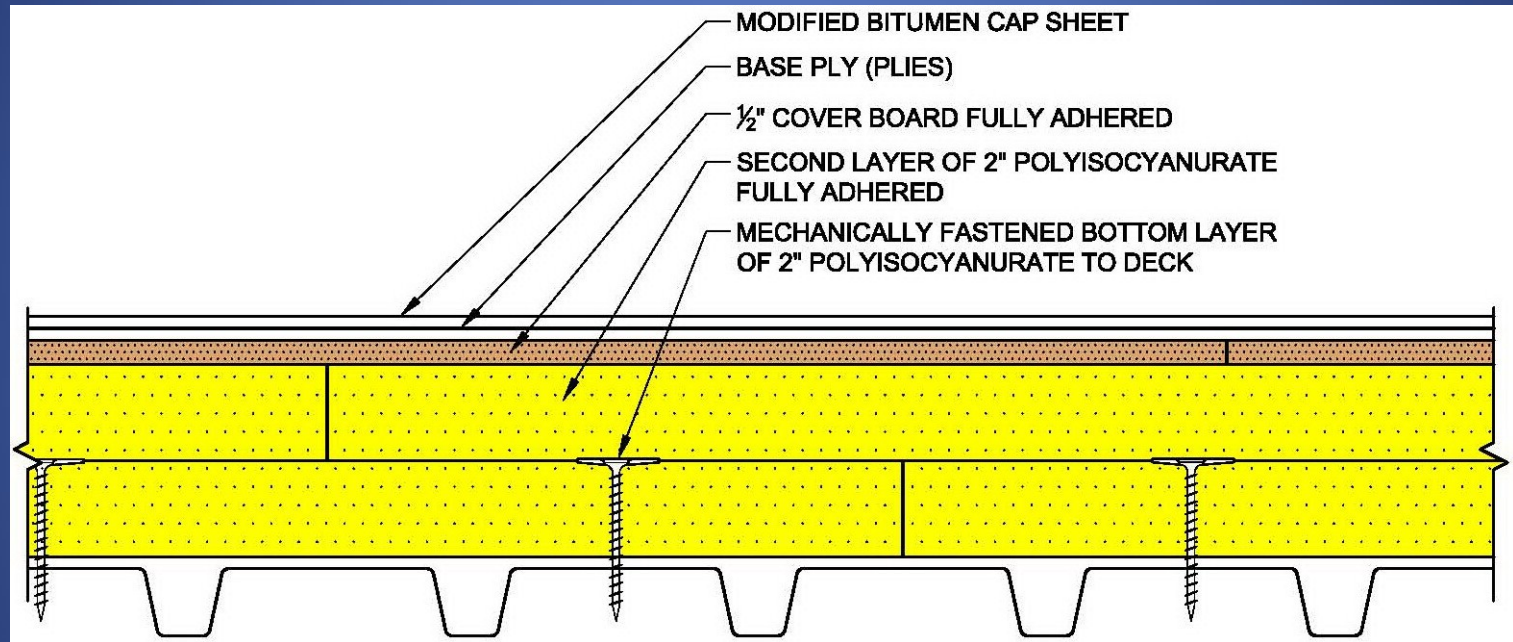
- Multi-ply bituminous Asphalt based
  - Asphalt built-up with gravel surface
  - Modified bitumen
- Single-ply chemical
  - Ethylene propylene diene monomer (EPDM)
  - Polyvinyl chloride (PVC)
  - Thermoplastic olefin (TPO)

# Roof Terminology

- Low slope roof = Less than 3:12 pitch
- Steep slope roof = Greater than 3:12
- Should be no such thing as a “Flat” roof



# 2009 IECC Requires R-22 Roof Insulation



# Mopping plies in hot asphalt



# Torching Energy Star Cap Sheet



# Applying with Cold Adhesive



# Ballasted EPDM Reroof



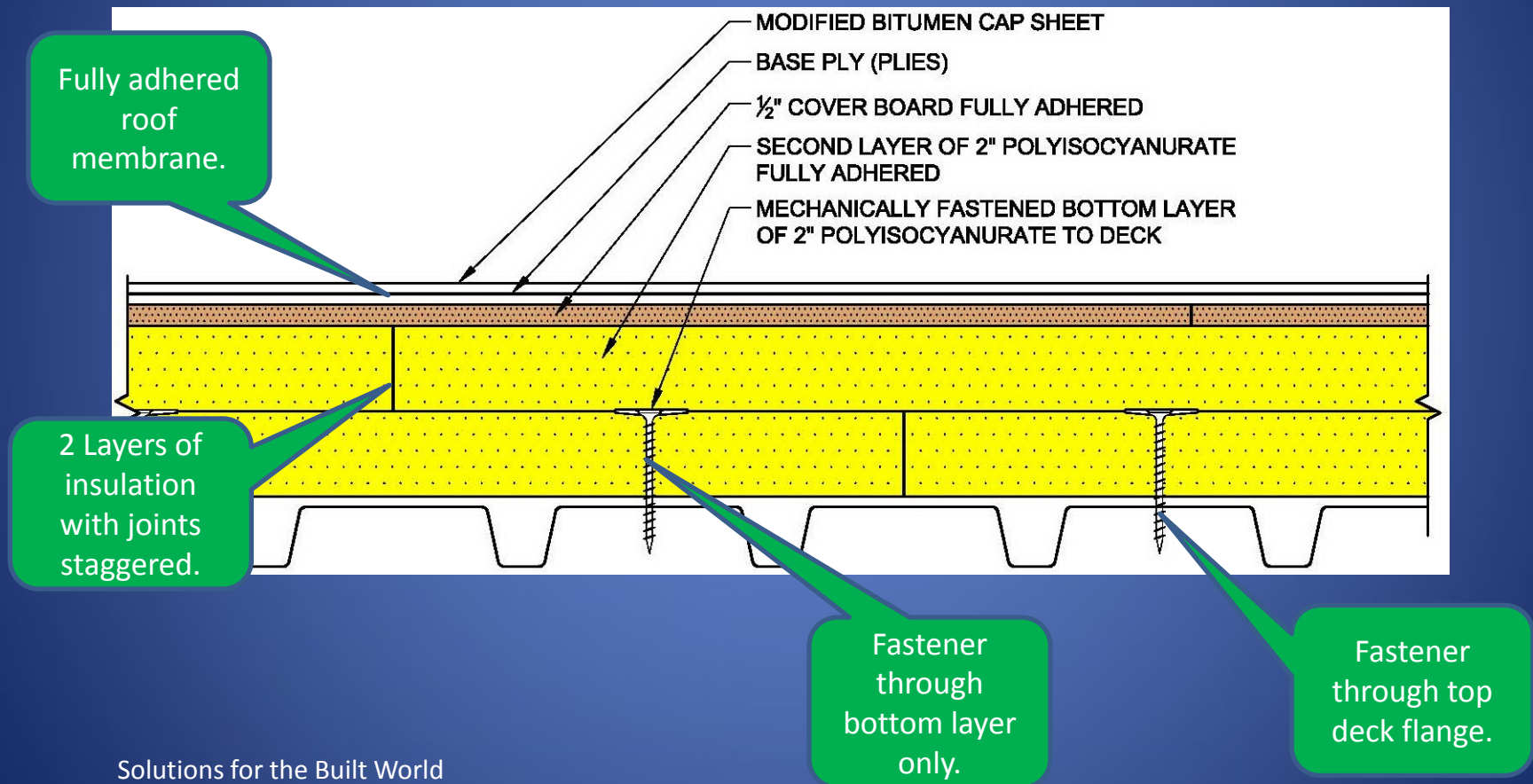
# TPO with Heat Welded Seams



# Three Main Problems with Reroofing.

- Code compliance by contractors.
  - Slope and drainage
  - Wind resistant design
  - Energy code compliance
- Recovered roofs vs. complete removal.
- Over-reliance on “cool roof” (white) concept.

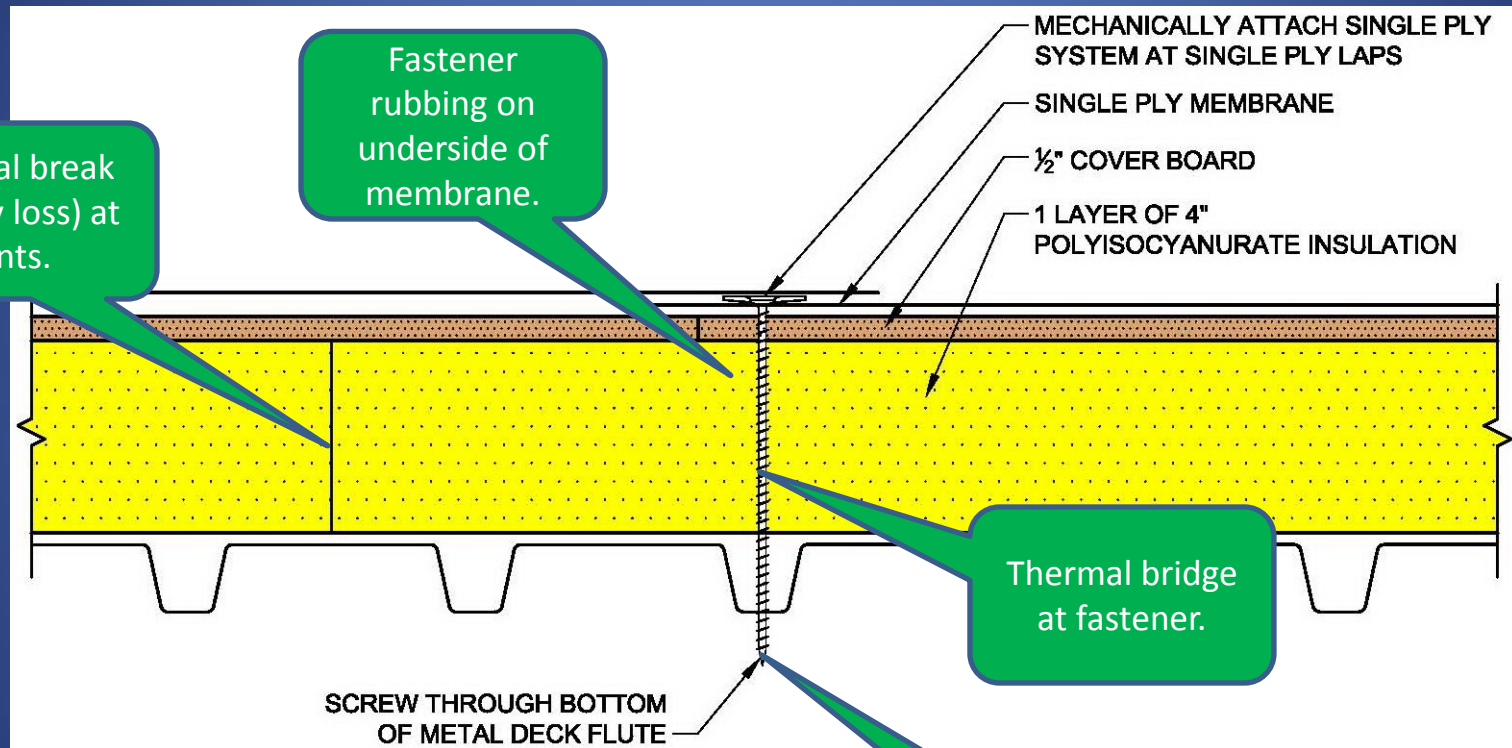
# Proper Modified Bitumen Roof System



Solutions for the Built World

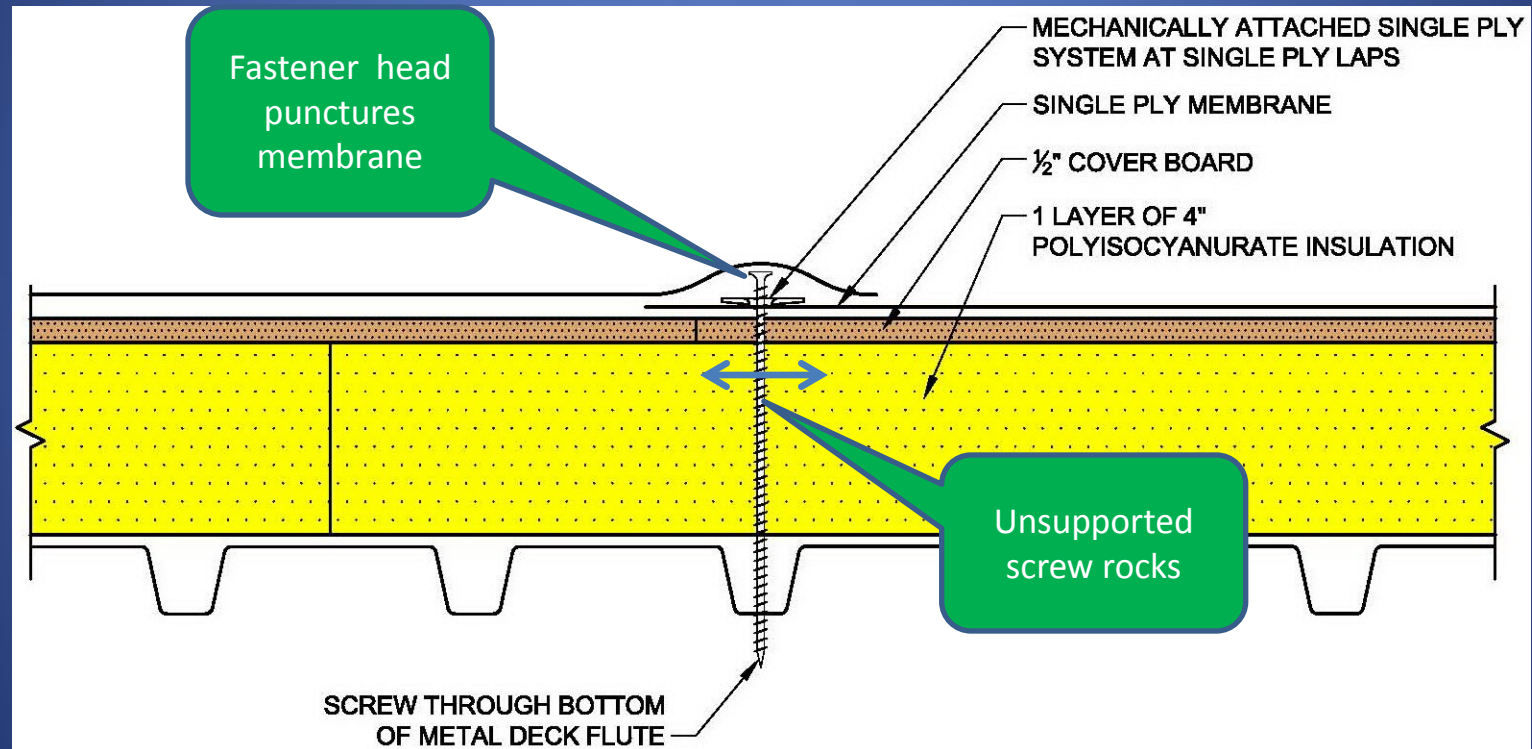
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# Typical Single Ply Roof Assembly



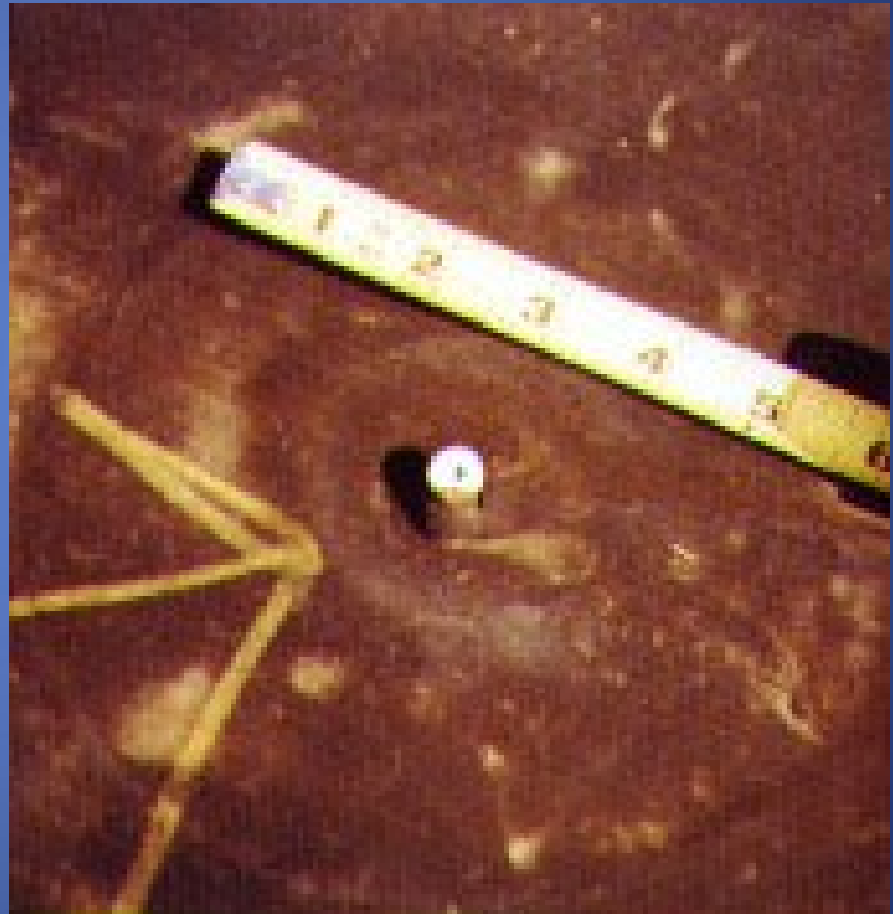
Fastener through bottom of flute.

# Single Insulation Layer Failure Mode



# Single Ply Failure Mode

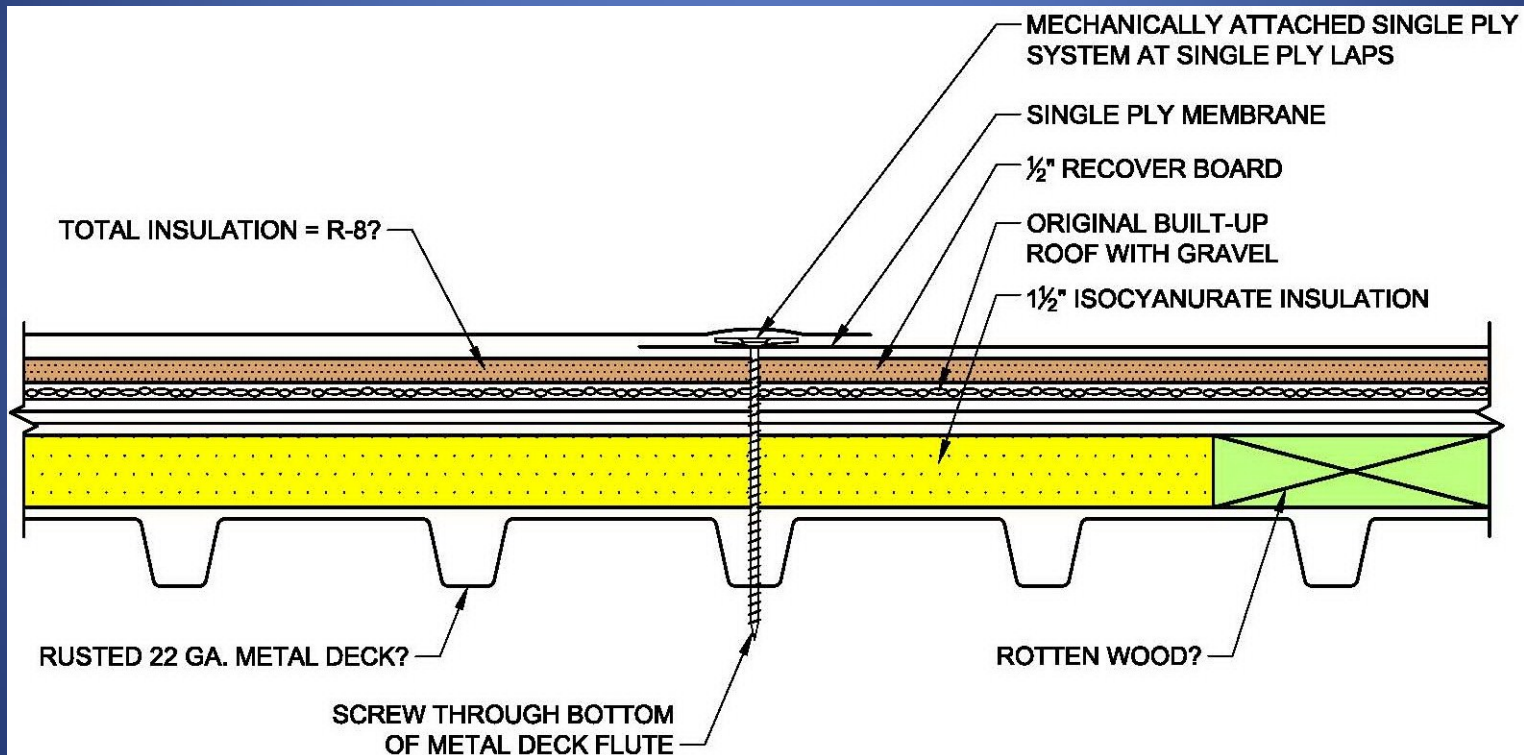
- Fastener Backout



# Myth No. 1

- Myth:
- Recovering an existing roof is just as good as tearing the old roof off plus it saves money.
- Fact:
- **Wrong.** Recovered roofs only last 2/3 as long as when roofs are torn off plus they fail to meet the Texas energy code.

# Recover Existing Roof



# Recover is Poor Value

- Recovered roofs last about 2/3 as long.
- Likely to cover up long-term deficiencies:
  - Wet insulation
  - Rotten wood nailers
  - Rusted deck
  - Poor drainage
- Usually do not meet the Texas Energy Code.
- Locks in energy inefficiency for 20 more years.

# Myth No. 2

- Myth:
- White roofs save energy.
- Fact:
- **Wrong.** Heat island effect maybe, but energy for your building? Unlikely.

# How Cool is a Cool Roof?

89 °F noon

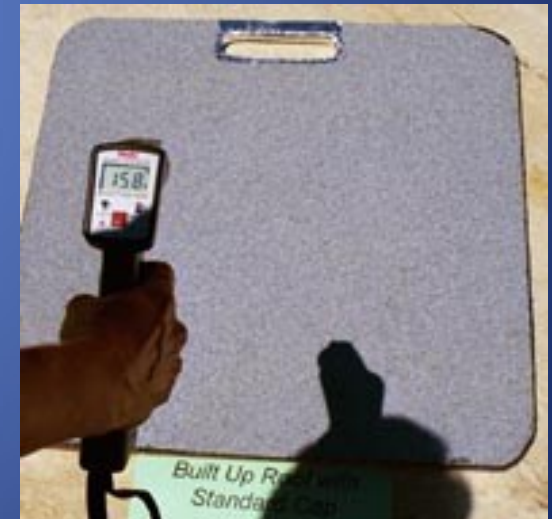
**EPDM  
single-ply  
173 °F**



**BUR topped  
with aggregate  
159 °F**



**BUR topped  
with capsheet  
158 °F**



# How Cool is a Cool Roof?

89 °F noon

Cool single-ply

121 °F

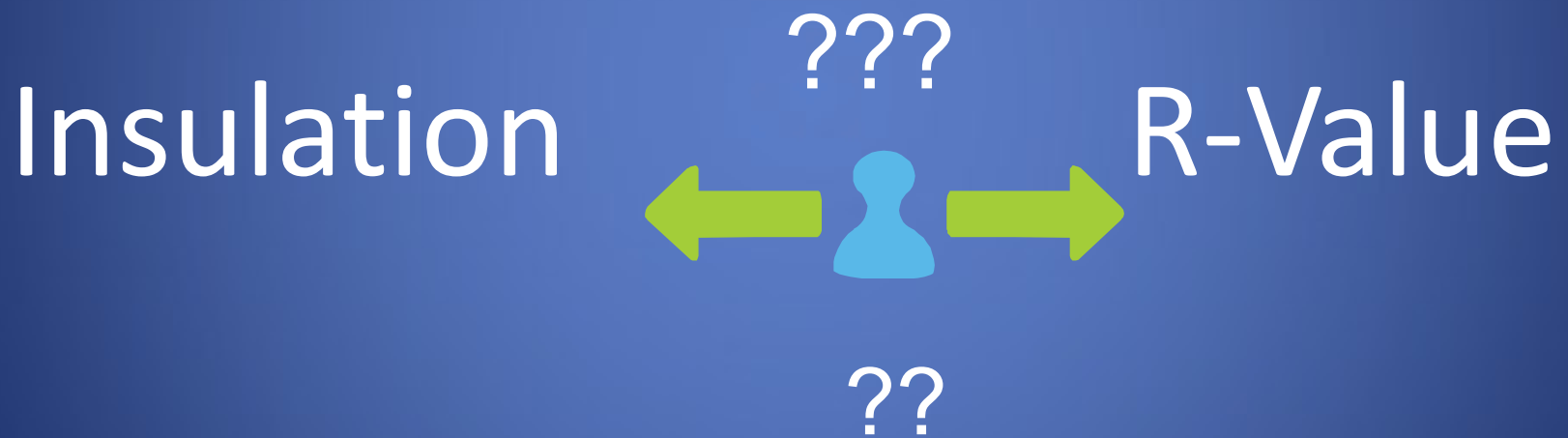


Cool coating over BUR

108 °F

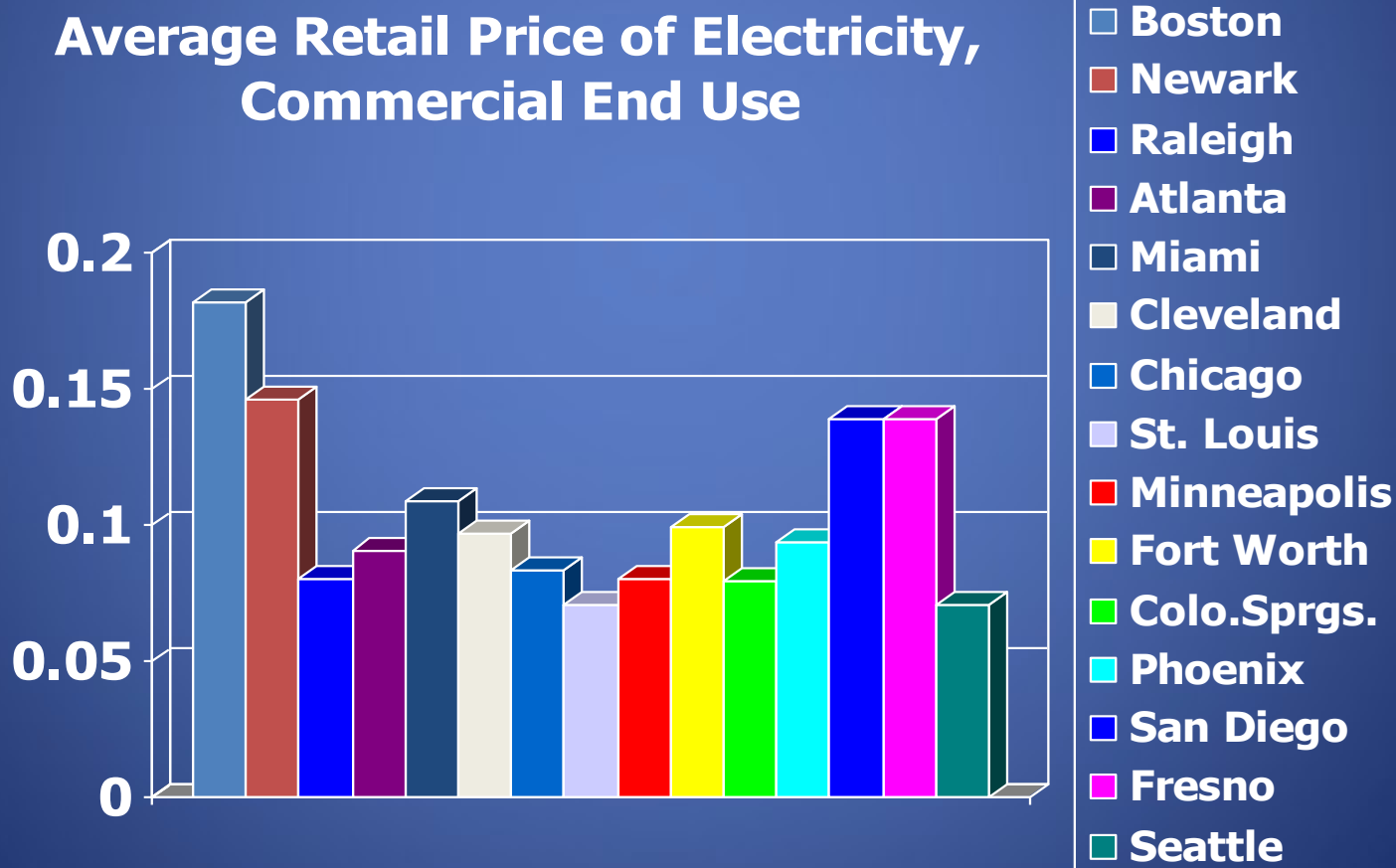


# So What Are the Trade-Offs?



# Energy Costs...

## Electricity for Commercial Customers, \$/kwh

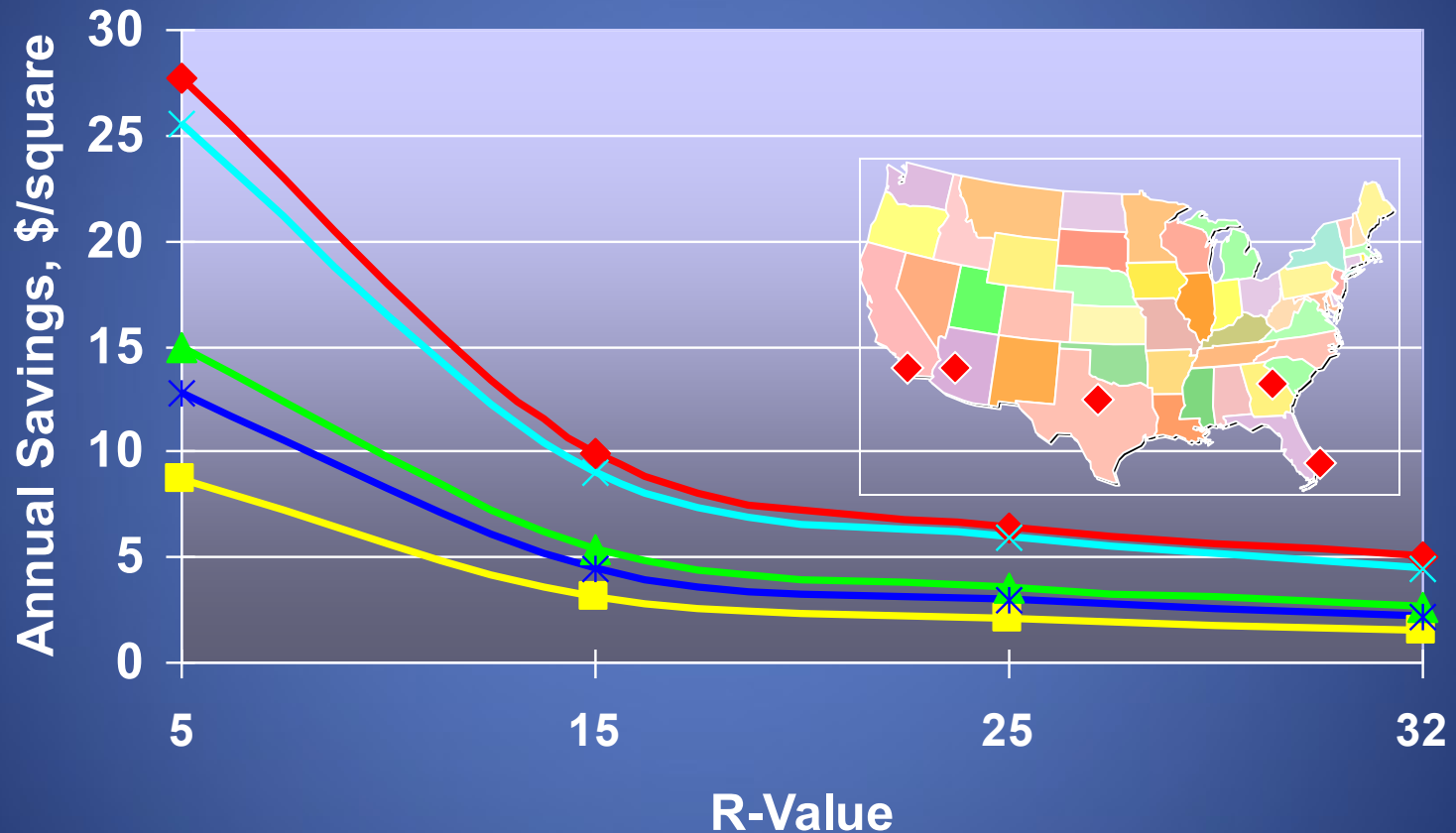


Source: EIA, 2009

# Annual Energy Savings

## Southern

Annual Energy Savings For a Reflective Roof Membrane vs. a Black Roof Membrane



◆ Miami ■ Atlanta ▲ Fort Worth ✕ Phoenix \* San Diego

# Keys to a Sustainable Energy Efficient Roofing System

- Most sustainable roof = longest life.
- Most energy efficient:
  - Insulation trumps “cool roof” effect
  - Texas Energy Code = R-22
- Design the entire assembly and all components, not just the skin.
- Tear off old roof; do not recover.

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